Sustainable Water Management in Massachusetts

GWPC Annual Meeting
Seattle WA
October 7, 2014

MA Executive Office of Energy and Environmental Affairs
Department of Conservation and Recreation
Department of Environmental Protection
Department of Fish and Game
Massachusetts Watersheds

Statewide Water Use
- 950+ users using more than .10 mgd
- 1,300+ mgd authorized annual average daily use
- 980+ mgd actual annual average daily use
  - 253 PWS users (70+% of total volumes)
  - 400+ cranberry growers (14000+ acres)
- 300+ other users (Golf, industrial, Ag.)
Water Management Act: Governs Water Allocation in Massachusetts

**Registrations (~850)**
- Water rights based on prior use (1981-1985)
- Minimal conditions without regulation change
- ~85% of state’s authorized volume
- Not subject to Safe Yield limitation

**Permits (~350)**
- New sources or additional volumes after registration period
- **20-year renewal** on basin schedule with 5-year reviews
- Subject to conditions
- ~15% of state’s authorized volume (but conditions touch 50% of water)
- Cannot permit volumes above Safe Yield
Water Management Act Purpose

Chapter 21G, Section 7 Reasonable protection of...

- Public drinking water supplies
- Water quality
- Wastewater treatment capacity
- Waste assimilation capacity
- Groundwater recharge areas
- Navigation
- Hydropower resources
- Fish and wildlife
- Water-based recreation
- Agriculture
- Reasonable conservation practices consistent with efficient utilization of water
- Reasonable economic development and creation of jobs
- Flood plains
- Wetland habitat
Upper Ipswich August Water Use
- 32 Public Water Supply Wells
- 10 Golf Course sources
- 11 – 12 MGD daily summer usage
Water Management Issues
### Sustainable Water Management Initiative Timeline

<table>
<thead>
<tr>
<th>Timeframe</th>
<th>Accomplishment</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007 to 2011</td>
<td>USGS Studies</td>
</tr>
<tr>
<td>January 2010 to February 2012</td>
<td>SWMI Process: 15 Advisory Committee Meetings 18 Technical Committee Meetings Numerous Work Group Meetings</td>
</tr>
<tr>
<td>November 2012</td>
<td>SWMI Framework released</td>
</tr>
<tr>
<td>May 2012 to February 2013</td>
<td>SWMI Pilots</td>
</tr>
<tr>
<td>January to June 2013</td>
<td>SWMI Grants, round 1 (round 2 under review)</td>
</tr>
<tr>
<td>Ongoing</td>
<td>Deliberations with stakeholder representatives</td>
</tr>
<tr>
<td>Ongoing since March 2013</td>
<td>Regulation and Guidance development</td>
</tr>
</tbody>
</table>
**Safe Yield and Environmental Protection**

**WMA Safe Yield** =
55% of Drought Basin Yield + Reservoir Storage

**Safe Yield Drought Protection** =
Remaining 45% of Drought Basin Yield

---

**Subbasin Scale** + **Seasonal Flow**

---

**Potentially Allocatable Water**
Science and Policy Informing New WMA Permit Requirements

- USGS Studies: August withdrawals and impervious cover have significant impact on fluvial fish
  - SYE MWI Fish and Habitat

- SWMI Advisory and Technical Committees helped us develop policy from science

- Five Biological and Groundwater Categories (1=least impact, 5 = most impact)
  - Categories use fluvial fish as surrogate for healthy aquatic habitat,
  - Impervious cover and August groundwater withdrawals used to represent impacts
  - Streamflow Criteria mark the boundaries between categories (310 CMR 36.14)
Science and Policy Informing SWMI

USGS Studies: August withdrawals and impervious cover have significant impact on fluvial fish.

SWMI Advisory and Technical Committees helped us develop policy from science.

Five Biological and Groundwater Categories (1=least impact, 5 = most impact)

Categories use fluvial fish as surrogate for healthy aquatic habitat.

Impervious cover and August groundwater withdrawals used to estimate impacts.

Streamflow Criteria mark the boundaries between categories (310 CMR 36.14)

---

**Biological Category (BC) for the Sustainable Water Management Initiative (SWMI)**

Legend

- Biological Category
- Percent Fluvial Fish Alteration

- **No Data**
- **0 - 5%**
- **>5 - 15%**
- **>15 - 35%**
- **>35 - 65%**
- **>65%**
- **Major Basins**

Biological Category (BC) for each subbasin is based on the simulated 2000-2004 existing condition of aquatic habitat using fluvial fish community characteristics as the surrogate variable. Each biological category represents the percent alteration within the range of these fluvial fish community characteristics as a function of the following subbasin parameters: 1) impervious cover; 2) cumulative groundwater withdrawal as a portion of the unimpacted August median flow; 3) stream channel slope; and 4) percent wetland within the stream buffer area.
Groundwater Withdrawal Category (GWC) for each subbasin is based on the ratio of 2000-2004 groundwater withdrawal volume to the unimpacted median monthly flow for August and represents conditions during the later summer bioperiod (July-September). Each GWC represents the range of this ratio that would result in the biological category of the same number under conditions of low (1%) impervious cover.
WMA Permit Conditions

1. Efficiency Requirements
   - 65 residential gallons per capita day (RGPCD)
   - 10% unaccounted-for-water (UAW)
   - BMPs (leak detection & repair, metering, pricing, public education etc.)

2. Seasonal limits on nonessential outdoor water use
Nonessential Outdoor Water Use Restrictions

Non-Essential: Uses not required for health or safety reasons, by regulation, for production of food or fiber, for maintenance of livestock, or to meet the core function of a business

<table>
<thead>
<tr>
<th>RGPCD for prior year</th>
<th>Calendar</th>
<th>STREAMFLOW</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 65</td>
<td>May 1 to Sept 30</td>
<td>Flow above ABF</td>
</tr>
<tr>
<td></td>
<td>7 day Low-Flow Trigger</td>
<td>Flow below ABF</td>
</tr>
<tr>
<td></td>
<td>7 days *</td>
<td>7 day Low-Flow Trigger</td>
</tr>
<tr>
<td></td>
<td>1 day *</td>
<td></td>
</tr>
<tr>
<td>&gt;65</td>
<td>7 days</td>
<td>7 days*</td>
</tr>
<tr>
<td></td>
<td>2 days *</td>
<td>1 day*</td>
</tr>
<tr>
<td></td>
<td>1 day*</td>
<td></td>
</tr>
</tbody>
</table>

* No watering 9 am to 5 pm on any day

ABF = Aquatic Base Flow
7 Day Low Flow calculated from period of record flows from a local USGS stream gage
New Permit* Requirements

- **CFR Consult** for withdrawals in subbasins with Coldwater Fishery Resources (CFRs)
- **Minimization** for groundwater withdrawals in “\( \geq 25\% \) August Net Groundwater Depleted” Subbasins
- **Mitigation** commensurate with impact, for requests above baseline, in consultation with agencies
- **Show no feasible alternative** for requests that change a category

*These do not apply to registrations*
Minimization

Required in subbasins defined as having an August net groundwater depletion (NGD) of 25% or more by MA Water Indicator Study data.

\[
\text{NGD} = \text{Aug unaffected flow} - \text{Aug GW withdrawals} + \text{Aug GW returns}
\]

Minimization Requirements (to the greatest extent feasible):

- Desktop Optimization
- Water Releases and Returns
- Additional Conservation Measures
Mitigation

**Mitigation Standard:**
- “commensurate with impact”, defined as:
  - volume of increase over baseline
  - does the increase cause a category change?
  - considers cost and efficacy

**Baseline is the largest of the following:**
- 2003 – 2005 water use + 5%
- 2005 water use + 5%
- the community’s registered volume
- Volume must be in compliance

**Permit Tiers**
- Tier 1 = No increase above baseline → no mitigation
- Tier 2 = Increase but no category change → commensurate mitigation
- Tier 3 = Increase and category change → commensurate mitigation (2:1 if indirect mitigation) show no feasible alternative
Direct Mitigation

Can be volumetrically calculated

Eligible Activities:

1. Infiltration and inflow improvements
2. Stormwater recharge (directly connected impervious area redevelop to recharge)
3. Surface water releases
Indirect Mitigation Activities

Qualitative Credit System

- Remove dam/flow barrier
- Culvert replacements meeting crossing standards
- Stream bank/channel/buffer restoration
- Private well bylaw
- Stormwater utility, bylaw with recharge or implement MS4*

*must result in increased recharge to get credit

- Acquire property in Zone I or II, or for other resource protection
- Infiltration/Inflow removal program
- Install & maintain fish ladder
Online SWMI Interactive Maps

- GIS map provides an interactive graphic display that includes:
  - GWC & BC
  - August Net groundwater depletion
  - Water use points
  - Cold Water Fishery Resources
  - Aquifers and more

Coldwater Fishery Resources

CFRs are considered a particularly sensitive receptor warranting protection.

PWS Potentially Impacting CFRs

- Abington-Rockland
- Hanover
- Kingston
- Marshfield
- Norwell
- Pembroke
DEP Permitting Tool

- Displays data and equations to determine BC, GWC, August NGD for 1400 subbasins.
- User may increase or decrease water use and see resulting change in above values.
- Two main views:
  - PWS information includes: recent usage, baseline volumes, projected usage, sources, and other users
  - Subbasin information includes: cumulative area, % of impervious cover, streamflow values, etc.
## DEP Permitting Tool

### Subbasin Characteristics
- **Sub Basin ID:** 22019
- **Major Basin:** South Coastal
- **HUC12 Name:** Indian Head River-Indian Head Brook to mouth

### Subbasin Cumulative Data
<table>
<thead>
<tr>
<th>Subbasin Information</th>
<th>August Wastewater Discharges (mgd)</th>
<th>August Groundwater Withdrawals (mgd)</th>
<th>Additional GW Withdrawal Volume to Cause a Change in Existing GWC and BC:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area (Square Miles):</td>
<td>14.95</td>
<td>Ground Water Discharge: 0.000</td>
<td>PWS and Commercial Wells: 1.264</td>
</tr>
<tr>
<td>Impervious Cover (%):</td>
<td>12.3</td>
<td>Septic Systems: + 0.602</td>
<td>Private Wells: + 0.049</td>
</tr>
<tr>
<td>Surface water withdrawals exist in or upstream of subbasin:</td>
<td>YES</td>
<td>Total Subsurface Discharge: 0.602</td>
<td>Total Groundwater Withdrawals: 1.313</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Surface Water (NPDES): 0.000</td>
<td></td>
</tr>
</tbody>
</table>

### Individual Subbasin Data
- **Coldwater Fisheries Resource Exist:** Yes

### Net Groundwater Depletion (NGD)
- **Net Groundwater Depletion (%):** 22.6
  - Positive value indicates depleted.
  - Negative value indicates surcharged.

### Unaffected streamflow, Ground Water withdrawals, Groundwater Withdrawal Category (GWC) and Biologic Category (BC).

<table>
<thead>
<tr>
<th>Estimated August Condition</th>
<th>Proposed Changes to existing GW Withdrawal</th>
<th>Existing vs. Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unaffected Streamflow (mgd)**</td>
<td>3.151</td>
<td>0</td>
</tr>
<tr>
<td>GW Withdrawals (mgd)**</td>
<td>- 1.313</td>
<td>- 1.313</td>
</tr>
<tr>
<td>(Unaffected Streamflow) – (GW Withdrawals)</td>
<td>- 1.839</td>
<td>- 1.839</td>
</tr>
<tr>
<td>(GW Withdrawals) / (Unaffected Streamflow)</td>
<td>41.7%</td>
<td>41.7%</td>
</tr>
<tr>
<td>Groundwater Withdrawal Category (1-5)</td>
<td>GWC: 4</td>
<td>GWC: 4</td>
</tr>
<tr>
<td>Biologic Category (1-5)</td>
<td>BC: 5</td>
<td>BC: 5</td>
</tr>
<tr>
<td>Proposed Groundwater Withdrawal Category (1-5)</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Proposed Biologic Category (1-5)</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

*Estimated streamflow is based on historical data and current conditions.

**Ground Water withdrawals are calculated based on current use and projected future use.

---

*Click on "X" in upper right of this form to close this window and return to main page.*

*Double Click on Sub Basin ID to view water use volumes*
Minimization Requirements

<table>
<thead>
<tr>
<th>Town</th>
<th>Subbasin(s)</th>
<th>Aug NGD %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norwell</td>
<td>22015</td>
<td>49%</td>
</tr>
<tr>
<td>Hanover</td>
<td>22015</td>
<td>49%</td>
</tr>
<tr>
<td>Scituate</td>
<td>22132</td>
<td>94%</td>
</tr>
<tr>
<td>Marshfield</td>
<td>22006, 22133</td>
<td>342%, 148%</td>
</tr>
<tr>
<td>Pembroke</td>
<td>22023</td>
<td>59%</td>
</tr>
</tbody>
</table>
Subbasins with Potential GWC changes

**Table:**

<table>
<thead>
<tr>
<th>Sub-basin</th>
<th>MGD to change GWC</th>
<th>GW towns in or upstream</th>
</tr>
</thead>
<tbody>
<tr>
<td>22013</td>
<td>.09</td>
<td>Hanover, Norwell</td>
</tr>
<tr>
<td>22018</td>
<td>.32</td>
<td>“”</td>
</tr>
<tr>
<td>22020</td>
<td>.22</td>
<td>“”</td>
</tr>
<tr>
<td>22016</td>
<td>.46</td>
<td>“” &amp; Pembroke</td>
</tr>
<tr>
<td>22019</td>
<td>.42</td>
<td>Pembroke</td>
</tr>
<tr>
<td>22071</td>
<td>3.93</td>
<td>All of above &amp; Marshfield</td>
</tr>
<tr>
<td>22090</td>
<td>4.76</td>
<td>“”</td>
</tr>
</tbody>
</table>
Further information

- MassDEP SWMI webpage at:  
  http://www.mass.gov/dep/water/resources/swmi.htm

- MassDEP Technical Resources webpage at:  

- Duane LeVangie  
  MassDEP  
  Water Management Program Chief  
  One Winter Street, Boston, MA 02108  
  duane.levangie@state.ma.us  
  617-292-5706